Health Aspects of

Marine Sanitation Devices:

Topic 1.2 Health Threats

Enabling Objectives

Health Threats

- 1.5 Identify the health threats associated with MSDs.
- 1.6 Identify infectious diseases associated with exposure to sewage.
- 1.7 Identify toxic gases that may be generated in MSDs.
- 1.8 Identify dangerous properties of gases that may be released from sewage.

HEALTH THREATS

- Diseases caused by infectious bacteria, viruses, or parasites that are often found in sewage and transmitted via the fecal-oral route.
- Death or injury from the release of toxic gases in confined spaces.
- Death or injury from fire or explosion.

Typhoid fevers

- **Incubation period**: usually 1-3 weeks.
- Still common in the developing world, where it affects about 12.5 million persons each year.
- 70% of U.S. cases are acquired while traveling internationally.
- Over the past 10 years, *travelers from the U.S. to Asia, Africa, and Latin America have been especially at risk.*

Centers for Disease Control Atlanta, Georgia

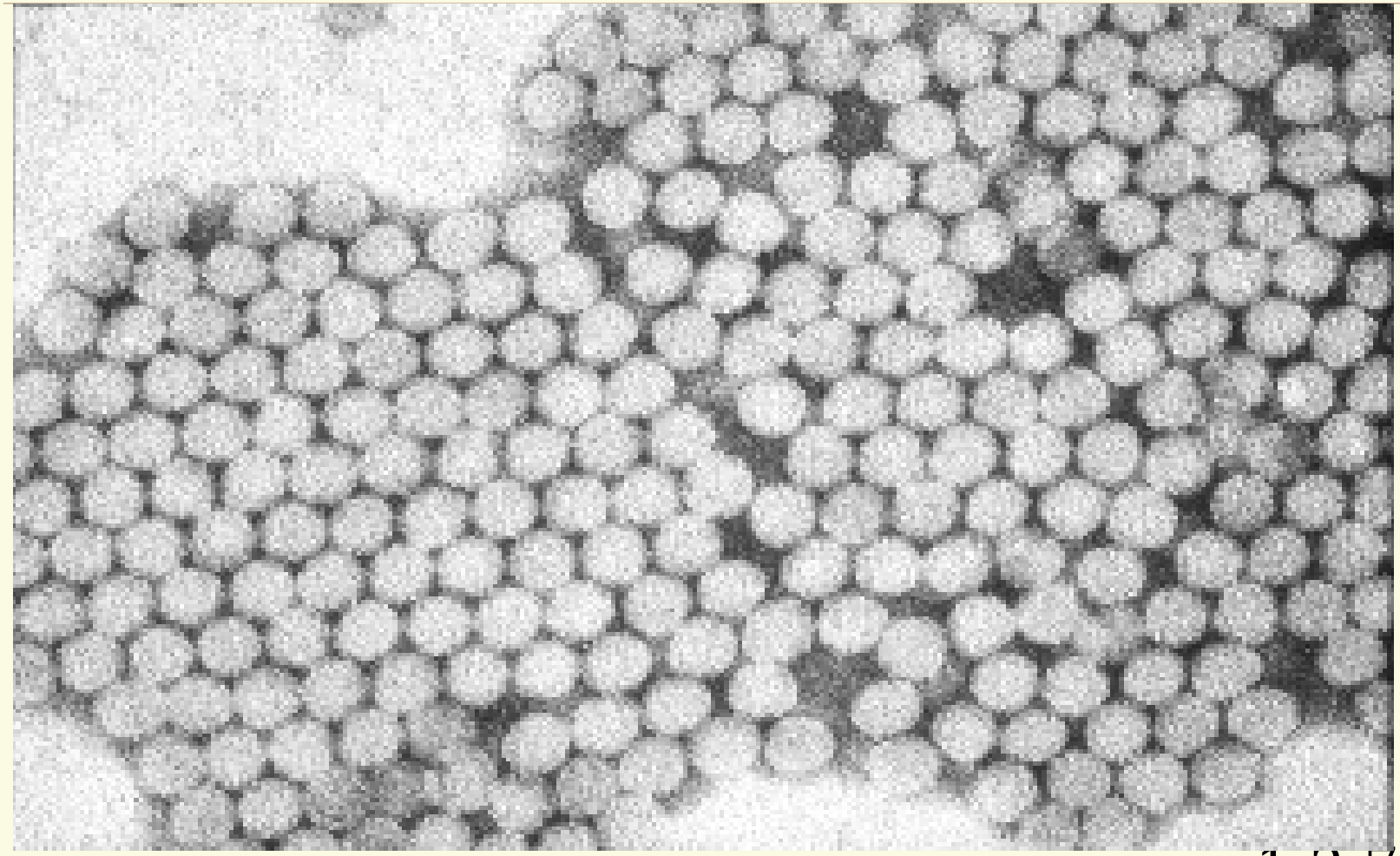
Typhoid fevers

- Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract.
- Both ill persons and carriers shed *S. Typhi* in their feces (stool).

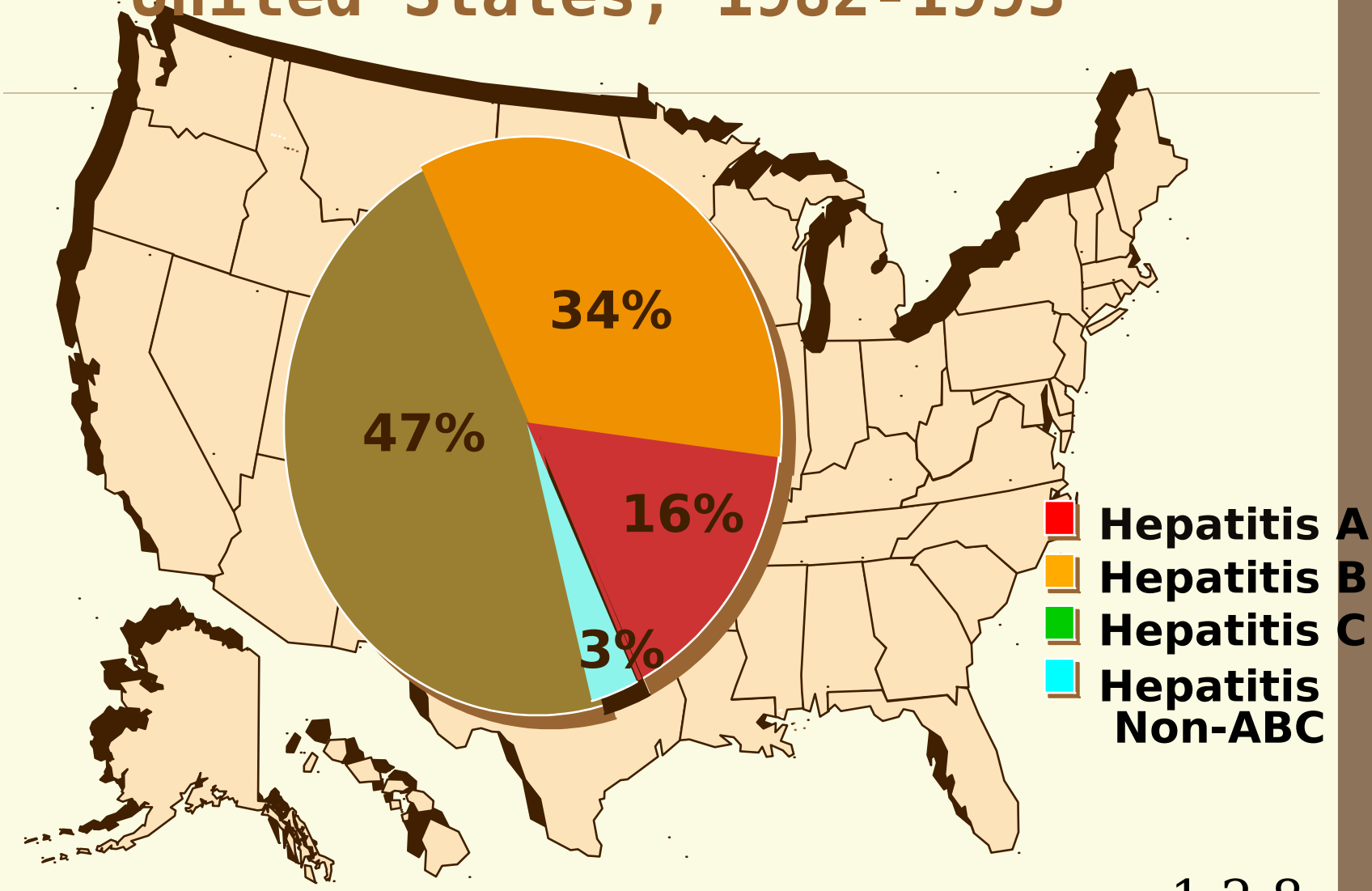
Shigellosis (Bacillary Dysentery)

- Shigella is a group of bacteria that has four different species that cause gastrointestinal illness.
- **Incubation period**: few hours to 5 days.
- Handwashing with soap and running water is the single most important preventive measure to interrupt transmission of shigellosis, especially during an outbreak.

Hepatitis A Virus



Acute Viral Hepatitis by Type, United States, 1982-1993



Source: CDC Sentinel Counties Study on Viral Hepatitis

Hepatitis A

- Incubation period: Average 30 days
- Jaundice by age group: <6 yrs, <10%
  6-14 yrs 40%-50%
  >14 yrs 70%-80%
- Complications: Fulminant hepatitis
  Cholestatic hepatitis

Source: CDC Sentinel Counties Study on Viral Hepatitis

Cholera

- Cholera is an acute, diarrheal illness caused by infection of the intestine with the bacterium *Vibrio cholerae*.
- Incubation period: a few hours to 5 days.
- Although cholera can be life-threatening, it is easily prevented and treated.

Tetanus

- Transmission: Introduced in to the body through wounds contaminated with soil, dusts, or **feces** that are harboring the tetanus spores.
- Incubation Period: usually 3-21 days.

Polio

- The last case in the Western Hemisphere occurred in Peru in 1991.
- Thousands of poliovirus infections still occur in other parts of the world. The majority of cases are now reported from the Indian subcontinent, Asia, and Africa.

Intestinal Parasites

Amebiasis

Giardiasis

Enterobiasis

Taeniaisis

LT Monteville
operation TT97
With *T.saginata*

1-2-13

Toxic Gases and Confined Spaces

CASE REPORTS OF FATAL INCIDENTS

The National Institute for Occupational Safety and Health (NIOSH) reports that 60% of confined space deaths involve would-be rescuers.

Toxic Gases and Confined Spaces

CASE REPORTS OF FATAL INCIDENTS

On May 13, 1985, a 21-year-old worker died inside a waste water holding tank while attempting to clean and repair a drain line. A second 21-year-old worker attempted a rescue and was also overcome. Asphyxiation by methane gas was the cause of death.

FATALITIES = 1 WORKER + 1 RESCUER

Toxic Gases and Confined Spaces

CASE REPORTS OF FATAL INCIDENTS

On December 29, 1983, a 54-year-old worker died inside a floating cover of a sewage digester while attempting to restart a propane heater that was being used to warm the outside of the sewage digester cover prior to painting it. An explosion occurred.

Toxic Gases and Confined Spaces

CASE REPORTS OF FATAL INCIDENTS

4 civilians killed in Yorktown mishap

YORKTOWN, Va. — Four civilian employees working at Yorktown Naval Weapons Station were killed in a sewage tank accident Sept. 12, base officials said.

The accident occurred when one of the workers entered a sewage tank on the station's pier on the York River to do some maintenance, said Kay Phillips, public information officer at Naval Ordnance Center, Atlantic Division.

He apparently was overcome by fumes while disconnecting a valve in the tank. With the valve disconnected, the tank partially filled with gas and sewage, she said.

Phillips said the other three workers entered the tank, apparently to rescue their colleague, and were overcome by fumes. Methane, an odorless, colorless and combustible gas, is often found in sewage tanks.

J. Thomas Black, a base spokesman, identified the dead as Randy Sparks and Orlando Welsh, both of the Lackey community in James City County; Jason Parker of Seaford; and Darrell Gauthier of Norfolk. The four worked for Virginia Beach-based Qualicon Corp.

— Compiled from staff and wire reports

FATALITIES = 1 WORKER + 3 RESCUERS

1-2-17

Hydrogen Sulfide

- Colorless, flammable gas.
- At a level of less than 0.2 parts per million (ppm) hydrogen sulfide may be detected as a rotten egg smell.
- Concentrations slightly higher than the OSHA's maximum exposure limit of 20 ppm can usually be tolerated as a strong smell.
- At higher levels or longer periods of moderate exposure, the odor will no longer be detectable.

Hydrogen Sulfide

- Health effects:
  - Lacrimation and sensitivity to light.
  - Irritation of the respiratory tract.
    - Runny nose
    - Pharyngitis
    - Bronchitis
    - Pneumonia
  - Increased respiratory rate.
  - Deep inhalation can result in hemorrhagic pulmonary edema.

Hydrogen Sulfide

- Health effects (continued).
  - deeper than usual breathing episodes.
  - respiratory paralysis.
  - brain damage.
  - death can result in minutes from pulmonary edema.

Methane (CH_4)

- A simple asphyxiant.
- **Health effects**:
  - Dizziness
  - Difficulty in breathing
  - Unconsciousness
  - Death

Carbon Dioxide

- Health effects
  - Dizziness
  - Difficulty breathing
  - Headache
  - Speech/vision changes
  - Unconsciousness
  - Death (at high concentrations for extended periods of time)

Enabling Objectives

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Question

- Health concerns about MSDs focus on

A. Diseases transmitted by viruses

B. Diseases transmitted by bacteria

C. Diseases transmitted by intestinal parasites

D. Exposure to toxic gases in confined spaces

E. Explosion/Fire

F. All of the above

Answer

- ✔ F. All of the above

Question

- Infectious Hepatitis A is characterized by:
  - A. Acute dysentery or chronic diarrhea of variable severity
  - B. Weakness, dizziness, anxiety, headache
  - C. Cyanosis, pinpoint pupils, convulsions
  - D. Nausea, abdominal pain, jaundice
  - E. Profuse watery diarrhea that may lead to severe dehydration & circulatory collapse

Answer

- D. Nausea, abdominal pain, & sometimes, but not always, jaundice

Question

- Giardiasis is caused by:
  - A. A tapeworm
  - B. A virus
  - C. A protozoan parasite
  - D. A bacterial infection
  - E. None of the above

Question

- Tetanus is a viral infection characterized by paralysis, usually of the extremities, with greater than 90% of inapparent infections.

  A. True

  B. False

Answer

- B. False. Polio is a viral infection characterized by paralysis, usually of the extremities, with greater than 90% of inapparent infections

Question

- Which is not true of Amoebiasis?
  - A. Causes acute dysentery or chronic diarrhea of variable severity.
  - B. Often asymptomatic, but there may be perianal itching.
  - C. Up to 50% of the populations in South America, Mexico, India, West & South Africa are carriers .
  - D. Infected foodhandlers can spread the disease
  - E. Flies serve as carriers of the cyst

Answer

- B. Often asymptomatic, but there may be perianal itching. This is a symptom of Enterobiasis, a helminth infection.

Question

- Name the three most common, toxic gasses associated with MSDs?
  - A. Methane
  - B. Hydrogen Sulfide
  - C. Carbon dioxide

Question

- Which is true about hydrogen sulfide?
  - A. Colorless, odorless , non-combustible gas
  - B. Causes dizziness, difficulty breathing, unconsciousness & death
  - C. Is produced when available dissolved oxygen in sewage is depleted by native bacteria & is a flammable odorless gas
  - D. Is produced from the action of anaerobic bacteria & is a flammable, odorless gas
  - E. Is commonly found in voids with little or no oxygen

Answer

- C. Is produced when the available dissolved oxygen in sewage is depleted by native bacteria

Question

- A gas that reacts violently with powerful oxidizers such as bromine, chlorine, fluorine & iodine & results from the action of anaerobic bacteria is:
  - A. Carbon dioxide
  - B. Hydrogen sulfide
  - C. Carbon monoxide
  - D. Methane
  - E. Nitrous oxide

Answer

- ✔ D. Methane

Question

What is the most common gas associated with decay or raw sewage?

A. Carbon dioxide
B. Methane
C. Hydrogen sulfide
D. Chlorine
E. Ammonia

Answer

C. Hydrogen Sulfide

Question

True or false?

You can see toxic gasses in confined spaces hovering just above the ground.

Answer: FALSE
Hydrogen sulfide, carbon dioxide, and methane are colorless

Question

- True or False? A strong odor will tell you that toxic gasses have formed in a confined space.

False: Both methane and carbon dioxide are odorl
tasteless. At high (extremely dangerous) concent
Hydrogen sulfide will cause olfactory fatigue

Question

- True or False? More confined-space deaths involve would-be rescuers than the persons they are trying to save.

  True: 60% involve rescuers